Fact Sheet

NPDES Permit Number: WA-003716-8
Public Notice Date: June 21, 2000
Public Notice Expiration Date: July 21, 2000
Technical Contact: Kelly Huynh 206 553-8414 or
1-800-424-4372 (within Region 10)
huynh.kelly@epa.gov

The U.S. Environmental Protection Agency (EPA) Proposes to Reissue a Wastewater Discharge Permit to:

City of Puyallup Wastewater Treatment Plant
2028 River Road
Puyallup, WA 98371

and the Puyallup Tribe proposes to Certify the Permit

EPA Proposes NPDES Permit Reissuance

EPA proposes to reissue a National Pollutant Discharge Elimination System (NPDES) permit to the City of Puyallup Wastewater Treatment Plant. The draft permit sets conditions on the discharge of pollutants from the City's waste water treatment plant to the Puyallup River. In order to ensure protection of water quality and human health, the permit places limits on the types and amounts of pollutants that can be discharged.

This fact sheet includes:

- information on public comment, public hearing, and appeal procedures
- a description of the current and proposed discharge
- a listing of past and proposed effluent limitations and other conditions
- a map and description of the discharge location
- detailed background information supporting the conditions in the draft permit

Puyallup Tribe Certification

The Puyallup Tribe proposes to certify the NPDES permit for the City of Puyallup, under section 401 of the Clean Water Act. The Tribe provided preliminary comments prior to the Public Notice which have been incorporated into the draft permit.

Public Comment

Persons wishing to comment on or request a public hearing for the draft permit may do so in writing by the expiration date of the Public Notice. All comments or requests for a public hearing should include the name, address and telephone number of the commenter and a concise statement of the exact basis of any comment and the relevant facts upon which it is based. All comments and requests for a public hearing must be in writing and should be submitted to EPA as described in the Public Comments Section of the attached Public Notice.

If no significant comments are received, the tentative conditions in the draft permit will become final, and the permit will become effective upon issuance. If comments are received, EPA will address the comments and issue the permit. The permit will become effective 33 days after the issuance date, unless a request for an evidentiary hearing is submitted within 33 days.

Documents are Available for Review

The draft NPDES permit and related documents can be reviewed or obtained by visiting or contacting EPA's Regional Office in Seattle between 8:30 a.m. and 4:00 p.m., Monday through Friday (See address below).

United States Environmental Protection Agency
Region 10
1200 Sixth Avenue, OW-130
Seattle, Washington 98101
(206) 553-0523 or
1-800-424-4372 (within Alaska, Idaho, Oregon and Washington)

The fact sheet and draft permit are also available at:

EPA Washington Operations Office
300 Desmond Drive SE
Lacey, WA 98503
360 753-9080

Puyallup Tribe
Environmental Department
2002 28th Street
Tacoma, WA 98404
253 573-7851

Washington Department of Ecology
300 Desmond Drive SE
Lacey, WA 98503
360 407-6275

For technical questions regarding the permit or fact sheet, contact Kelly Huynh at the phone numbers or email address at the top of this fact sheet. Those with impaired hearing or speech may contact a TDD operator at 1-800-833-6384. Ask to be connected to Kelly Huynh at the above phone numbers. Additional services can be made available to persons with disabilities by contacting Kelly Huynh.

TABLE OF CONTENTS

LIST OF ACRONYMS

AML	Average monthly limit
BMP	Best management practices
BOD_5	Five-day Biochemical oxygen demand
CFR	Code of Federal Regulations
cfs	Cubic feet per second
CWA	Clean Water Act
DMR	Discharge monitoring report
CV	Coefficient of variation
EPA	United States Environmental Protection Agency
lb/day	Pounds per day
LTA	Long term average
MDL	Maximum daily limit or method detection limit
mgd	Million gallons per day
mg/l	Milligrams per liter
ml	Milliliters
MOA	Memorandum of agreement
NPDES	National Pollutant Discharge Elimination System
O&M	Operation and maintenance
POTW	Publicly owned treatment works
RP	Reasonable potential
TMDL	Total maximum daily load
TSD	*Technical Support Document for Water Quality-based Toxics Control*, (EPA 1991)
TSS	Total suspended solids
USGS	United States Geological Survey
WWTP	Wastewater treatment plant
WLA	Wasteload allocation
Fg/L	Micrograms per liter

BACKGROUND INFORMATION

I. APPLICANT

City of Puyallup Wastewater Treatment Plant
NPDES Permit No: WA-003716-8

Facility Location:	Mailing Address:
2028 River Road	218 West Pioneer Avenue
Puyallup, WA 98371	Puyallup, WA 98371

Facility contact: Tom Heinecke, Public Works Director

II. FACILITY ACTIVITY

The City of Puyallup owns and operates a municipal treatment facility that provides secondary treatment and disinfection of domestic and industrial wastes prior to discharge to the Puyallup River. Based on the application submitted by the City, the annual average design flow is 9.46 mgd and the average wet weather design flow is 10.7 million gallons per day (mgd). Biosolids generated during the treatment process are hauled by Rabanco, a private contractor, to a land application site in Yakima and Benton Counties, Washington.

See Appendix A for a map of the location of the treatment plant and discharge. Appendix B contains a detailed discussion of the treatment processes and waste streams.

III. RECEIVING WATER

The Puyallup Wastewater Treatment Plant (WWTP) discharges to the Puyallup River at river mile 6.85 (latitude 47^{O} 12' 25" N, longitude 122^{O} 19' 15" W). This segment of the river is part of trust property on the Puyallup Tribe of Indians' Reservation.

The Puyallup Tribe's Water Quality Standards designate beneficial uses for waters of the Reservation. The Puyallup River is designated as Class A in the vicinity of the outfall. Characteristic uses include the following: domestic, industrial and agricultural water supply, stock watering, fish and shellfish (including salmonids, crustaceans and other shellfish, and other fish), wildlife habitat, ceremonial and religious water use, commerce, navigation, and primary and secondary recreation.

The lower Puyallup River is listed on Washington's 303(d) list (a list of impaired waters compiled under section 303(d) of the Clean Water Act) as not meeting standards for dissolved oxygen. To address this problem, the Washington

Department of Ecology (Ecology) established a seasonal total maximum daily load (TMDL) for ammonia and biochemical oxygen demand (BOD_5) throughout the Puyallup River basin and tributaries effective May 1 through October 31. This TMDL was used in establishing the limits for BOD_5 and ammonia in the draft permit. (See Section IV of Appendix C for details.)

IV. FACILITY BACKGROUND

A. Treatment System

The original collection system for the City's wastewater was constructed in 1905 as a gravity sewer system discharging directly into the Puyallup River. The collection system at that time included combined storm and sanitary sewers. In 1955, a 6.0 mgd sewage treatment plant providing primary treatment and disinfection was constructed at the present site. In 1971, the City of Puyallup began a wastewater collection and treatment rehabilitation program to reduce excessive flows caused by the combined sewer system and to meet water quality standards. The construction of the rehabilitated wastewater collection and treatment system was completed in 1981. The rehabilitated system reduced peak flows from 24 mgd to 13 mgd. The rehabilitated facility was designed for an average wet weather flow of 10.72 mgd and a peak design flow of 19.0 mgd.

On May 16, 1997, Ecology approved a General Sewer Plan submitted by the City that modified their service area and a Facilities Plan for upgrade to the WWTP. The plans and specifications for the WWTP upgrade were approved on August 25, 1997. The City received a State Revolving Fund loan to construct the facility.

B. Permit Status

On June 30, 1994, the Washington Department of Ecology issued a National Pollutant Discharge Elimination System (NPDES) permit to the City. The permit established interim effluent limitations for chlorine, ammonia, copper, and mercury and a schedule to achieve compliance with final effluent limits for these parameters. Ecology modified this permit in 1996 to change the limitations for copper, mercury, and ammonia.

In 1997, EPA, the Puyallup Tribe, and Ecology signed a memorandum of agreement (MOA) regarding implementation of the NPDES permit program on the Puyallup Reservation. The MOA recognized that the federal government has the authority to issue NPDES permits for discharges to waters of the Reservation. In addition, the MOA stipulated that Ecology would provide technical review and permit preparation services for NPDES permits on the

Reservation and that EPA would issue the permits. This draft permit has been prepared jointly by EPA, Ecology, and the Tribe under the conditions of the MOA.

The City submitted an application for permit renewal on December 12, 1998. Because the City submitted a timely application, the 1994 permit has been administratively extended and the City is authorized to continue discharging until the permit is reissued.

C. Compliance Status

Prior to 1997, the City generally reported compliance with its permit limitations. In 1996, the facility reported some minor violations. However, there was an increase in reported effluent limitation violations at the facility in 1997. Table 1 summarizes the reported violations between January 1996 and March 1999.

Table 1: Reported Effluent Limit Violations 1/96- 3/99

Year	Parameter	# of Violations
1996	BOD_5 percent removal (%)	3
	TSS percent removal (%)	1
	Percent of fecal coliform values exceeding 200/100 ml (%)	2
1997	Average monthly flow (mgd)	1
	BOD_5 mass limit (lb/day)	2
	BOD_5 percent removal (%)	1
	TSS mass limit (lb/day)	2
	Residual chlorine limit (µg/l)	10
	Percent of fecal coliform values exceeding 200/100 ml (%)	1
1998-1999	Overflow	3
1998-1999	BOD_5 concentration limit (mg/l)	4
	BOD_5 mass limit (lb/day)	8
	BOD_5 percent removal (%)	3
	TSS concentration limit (mg/l)	5
	TSS mass limit (lb/day)	8
	TSS percent removal (%)	4

V. EFFLUENT LIMITATIONS

EPA followed the Clean Water Act (CWA), Tribal and federal regulations, and EPA's 1991 *Technical Support Document for Water Quality-Based Toxics Control* (TSD) to develop the proposed effluent limits. In general, the Clean Water Act requires that the effluent limits for a particular pollutant be the more stringent of either the technology-based or water quality-based limits. Appendix C provides the basis for the development of technology-based and water quality-based effluent limits.

Technology-based limits are set based on the level of treatment that is achievable using readily available technology. For publicly owned treatment works, federal regulations include technology-based limits for three parameters: five-day biochemical oxygen demand (BOD_5), total suspended solids (TSS), and pH.

The Agency evaluates the technology-based limits to determine whether they are adequate to ensure that water quality standards are met in the receiving water. If the limits are not adequate, EPA must develop additional water quality-based limits. These limits are designed to prevent exceedences of the Puyallup Tribe's water quality standards in the Puyallup River. The proposed permit includes water quality-based limits for BOD_5, fecal coliform bacteria, total ammonia, copper, lead, mercury, and zinc. Appendix D provides an example calculation for development of a water quality-based permit limit.

Table 2 compares the limits in the 1994 permit with those in the draft permit.

Table 2: Outfall 001 Effluent Limits Comparison

Parameter	Average Monthly Limit		Average Weekly Limit		Maximum Daily Limit	
	Draft	1994	Draft	1994	Draft	1994
BOD_5, Effluent						
mg/l	30	30	45	45	---	---
lb/day	2,178	1,390	3,268	2,085	---	---
Percent Removal[1]	85	85	---	---	---	---
BOD_5, Influent						
lb/day	---	---	---	---	---	9267
TSS, Effluent						
mg/l	30	30	45	45	---	---
lb/day	2,370	1,390	3,550	2,085	---	---
Percent Removal[1]	85	85	---	---	---	---

Table 2: Outfall 001 Effluent Limits Comparison

Parameter	Average Monthly Limit		Average Weekly Limit		Maximum Daily Limit	
	Draft	1994	Draft	1994	Draft	1994
TSS, Influent lb/day	---	---	---	---	---	9,267
Fecal Coliform, #/100 ml[2]	100	100	---	---	---	---
Total Ammonia (as N) November 1 - April 30 mg/l lb/day	 5.9 470	 9.5 ---	 --- ---	 --- ---	 12 950	 18 ---
Total Ammonia (as N), lb/day May 1 - October 31 mg/l lb/day	 5.9 470	 --- ---	 --- ---	 --- ---	 12 792	 --- 880
Copper, Total Recoverable µg/l lb/day	 7.6 600	 --- ---	 --- ---	 --- ---	 10 790	 --- ---
Lead, Total Recoverable µg/l lb/day	 5.6 440	 --- ---	 --- ---	 --- ---	 11 870	 --- ---
Mercury µg/l[3] lb/day	 0.010 0.79	 0.014 ---	 --- ---	 --- ---	 0.019 1.5	 0.019 ---
Zinc, Total Recoverable µg/l lb/day	 43 3,400	 --- ---	 --- ---	 --- ---	 86 6,800	 --- ---
pH, std units	---	---	---	---	6.0-9.0[4]	6.0-9.0[4]
Flow, mgd Monthly Avg Wet Weather Monthly Avg Dry Weather Instantaneous Peak	 --- --- ---	 10.42 4.78 ---	 --- --- ---	 --- --- ---	 --- --- ---	 --- --- 18.98
Total Residual Chlorine µg/l	 ---	 21	 ---	 ---	 ---	 50

Footnotes:
1 The percent removal requirements represent a minimum.
2 The 1994 and draft permits also contain the requirement that no more than 10% of samples over a 30 day period may exceed 200/100 ml.
3 Metals limits in the draft permit are based on the total recoverable form of the metal.
4 The draft permit requires that the pH be within the specified range at all times.

In addition to the limits for specific parameters in Table 1, the draft permit prohibits the discharge of waste streams that are not part of the normal operation of the facility, as reported in the permit application. The draft permit also requires that the discharge be free from floating, suspended, or submerged matter in concentrations that cause/may cause a nuisance.

VI. PRETREATMENT PROGRAM

Section 301(b) of the Clean Water Act requires that industrial users who discharge to publicly owned treatment works comply with pretreatment requirements established under section 307 of the CWA. The objectives of the pretreatment program are: 1) to prevent the introduction of pollutants to the treatment system that will interfere with the plant's operation, that could pass untreated through the system and contribute to water quality problems, or otherwise be incompatible with the treatment plant, and 2) to improve opportunities to reclaim and recycle municipal and industrial waste water and sludges.

The 1994 permit required the City of Puyallup to conduct influent, effluent, and sludge monitoring for priority pollutants listed in Table II of 40 CFR 122 Appendix D and develop appropriate local limits. However, under the 1994 permit, the City was not required to establish an approved pretreatment program.

The draft permit requires the City to develop and implement a pretreatment program in accordance with the general pretreatment regulations at 40 CFR §403. A draft program must be submitted to EPA for approval within **12 months of the effective date** of the permit. At a minimum, the pretreatment program submittal must include a local limits evaluation for pollutants of concern, a proposed local sewer use ordinance, verification by the city's attorney that the City has the legal authorities to conduct the pretreatment program, and implementation policies and procedures (e.g. enforcement, compliance monitoring, permit administration, and data management), including funding and staffing levels to manage the pretreatment program.

Once the pretreatment program is being implemented, the draft permit requires the City to enforce pretreatment standards promulgated under section 307 of the CWA, issue permits to significant industrial users that contain limits and other conditions, maintain records, carry out inspections, and obtain remedies for non-compliance by industrial users. The draft permit also requires monitoring of influent and sludge twice a year for metals and cyanide. In addition, the draft permit requires that metals analyses be conducted using the most sensitive EPA-approved methods, unless a less sensitive method is approved by EPA's Pretreatment Coordinator. This provision ensures that the City will use the most sensitive EPA-approved analytical method currently available when influent or

effluent concentrations for a particular pollutant are near or below the lowest method detection limit without imposing the financial burden of using these methods when a less sensitive method will provide quantifiable data. Finally, the draft permit requires the City to submit an annual report describing pretreatment program activities.

VII. MUNICIPAL SEWAGE SLUDGE/BIOSOLIDS MANAGEMENT

Under the CWA, EPA has the authority to issue separate NPDES permits for the purpose of regulating biosolids (sewage sludge). These "sludge only permits" can be separate from the permits issued under the CWA for wastewater discharges. The City has submitted an application to EPA for a sludge-only permit. The application covers the following current activities and options for future biosolids use or disposal:

> The existing sludge disposal activities include dewatering and contracting with Rabanco for transfer to the Natural Selection Farms for land application in Yakima and Benton Counties in the general vicinity of Prosser and Mabton. The City has signed an interlocal agreement with the King County Department of Metropolitan Services (Metro) for backup disposal services.
>
> In the future, the City may dispose of biosolids by land application at currently unknown sites in the general vicinity of Prosser and Mabton.
>
> In the future, the City may transfer sludge to other facilities for biosolids blending or further treatment. In this case, the ultimate use or disposal of the final product would be covered under the permits of those facilities. These facilities may include other sewage treatment plants, private processors, or composting operators.

The City reports that current practices and future options have been given public notice through the state biosolids permit application process by either the City or Natural Selection Farms. Natural Selection Farms is a recognized land application facility which has been previously permitted by the local health departments and which has come under the new Washington State biosolids program.

VIII. MONITORING REQUIREMENTS

A. Effluent Monitoring

> Section 308 of the Clean Water Act and federal regulation 40 CFR 122.44(i) require that monitoring be included in permits to determine compliance with effluent limitations. Monitoring may also be required to gather data for future effluent limitations or to monitor effluent impacts on receiving water quality.

The City of Puyallup is responsible for conducting the monitoring and for reporting results to EPA on Discharge Monitoring Reports (DMRs).

Table 3 compares the proposed monitoring requirements in the draft permit to those in the 1994 permit. Monitoring frequency is based on the minimum sampling necessary to adequately monitor the facility's performance as well as the monitoring requirements in the 1994 permit.

Table 3: Outfall 001 Monitoring Requirements

Parameter	Draft Sample Frequency	1994 Sample Frequency
BOD_5, mg/l, lb/day, percent removal[1]	5/Week	3/Week
TSS, mg/l, lb/day, percent removal[1]	5/Week	3/Week
Fecal Coliform Bacteria, #/100 ml	5/Week	3/Week
Total Ammonia as N, mg/l	2/Week	2/Week
Copper, Total Recoverable, µg/l	Monthly	Monthly
Lead, Total Recoverable, µg/l	Monthly	Quarterly[2]
Mercury, Total Recoverable, µg/l	Monthly	Monthly
Zinc, Total Recoverable, µg/l	Monthly	Quarterly[2]
pH, standard units[3]	Continuous	Daily
Flow, mgd	Continuous	Continuous
Temperature, EC	Daily	Daily
Chronic Whole Effluent Toxicity Testing	Annual	Quarterly for 1st year, twice in the last year
Hardness, mg/l $CaCO_3$	Monthly	---
UV Intensity, UV units	Continuous	---
Acute Whole Effluent Toxicity Testing	---	Quarterly for 1st year, twice in the last year
Total Residual Chlorine, mg/l	---	Daily
Rainfall	---	Daily

Footnotes:
1 The draft permit and the 1994 permit require influent and effluent monitoring to determine compliance with effluent limitations and percent removal requirements.
2 Monitoring was required as part of the City's pretreatment requirements.
3 The draft permit requires the City to report the number and duration of pH excursions during the month.

B. Method Detection Limits

EPA's regulations require that permittees monitor for compliance with effluent limits using methods promulgated by EPA at 40 CFR Part 136. The water quality-based limits in the draft permit for copper and lead are near the method detection limit (MDL) for the most sensitive methods in Part 136. The water quality-based limits for mercury are below the MDL for the most sensitive methods in Part 136.

EPA Region 10 has developed internal guidance for permit writers and compliance officers to address the issues of implementing and enforcing effluent limits that are below the most sensitive MDLs. This guidance requires that the water quality-based limits be included in the permit, even though compliance with these limits cannot be determined. Instead, the City will be considered to be in compliance with the limits if the concentration of mercury in the effluent is below the minimum level (ML). The ML is defined as the lowest concentration that gives recognizable signals and an acceptable calibration point. In other words, the ML represents the lowest concentration that can be reliably quantified. The ML for mercury is 0.2 µg/l. EPA believes that the use of the ML as an analytical chemistry performance standard provides an unambiguous and rational means to demonstrate that the best chemistry available at the time of permit issuance is being used.

For all other pollutants, the draft permit requires the City to use an EPA-approved method with an MDL 0.1 times the effluent limitation or the most sensitive EPA-approved method, whichever is greater. This provision ensures that, to the extent possible, data can be used to accurately determine compliance with permit limits without imposing an undue burden on the City where a less sensitive method will give accurate data.

C. Whole Effluent Toxicity

Federal regulations at 40 CFR 122.44(d)(1) require that permits contain limits on whole effluent toxicity when a discharge has reasonable potential to cause or contribute to an exceedence of a water quality standard. Section 5, paragraphs 1 and 2 of the Puyallup water quality standards prohibit the discharge of toxic substances in toxic amounts and require that toxicity testing be used to determine compliance with this prohibition.

Whole effluent toxicity tests are laboratory tests that replicate to the greatest extent possible the total effect and actual environmental exposure of aquatic life to effluent toxicants without requiring the identification of specific toxicants. Whole effluent toxicity tests use small vertebrate and invertebrate species and/or plants to measure the aggregate toxicity of an effluent. There are two

different durations of toxicity test: acute and chronic. Acute toxicity tests measure survival over a 96-hour exposure. Chronic toxicity tests measure reductions in survival, growth, and reproduction over a 7-day exposure.

The City of Puyallup's 1994 permit required quarterly acute and chronic toxicity testing for the first year and two acute and chronic toxicity tests in the final year of the permit. This testing showed no reasonable potential to cause or contribute to exceedences of the water quality standard. This testing, however, generated only 6 data points each for acute and chronic toxicity. Where there are fewer than 10 data points, the TSD recommends using a default CV of 0.6 to evaluate reasonable potential to exceed water quality standards. EPA believes that it is preferable to use a site-specific CV. To allow the City to spread the cost out, the permit requires **annual testing** to generate 5 additional chronic data points.

D. Outfall Evaluation

Because of sediment deposition of gravel and rocks, most of the ports in the original diffuser were damaged. The City estimated that only seven ports remained intact and were usable. To address this problem, the City installed a secondary outfall point to discharge flows in excess of 6.0 mgd. In early 1998, the City began construction of a new facility, including modification to the existing diffuser ports to prevent damage by gravel and rocks. The diffuser ports are angled downstream with a "Tide Flex" valve connected with a neoprene sleeve and flange.

To ensure that the new diffuser is not damaged by sediment deposition, the draft permit requires the City to conduct an outfall evaluation during the **second and fourth year** of the permit term.

E. Infiltration and Inflow Evaluation

In the past, significant rainfall events have been a source of primary-treated overflows to the Puyallup River from the outfall. Infiltration and inflow to the conveyance system might include rainwater entering manholes, roof drain connections, combined stormwater and sewage piping, infiltration through leaky underground pipes, etc. The draft permit requires that the permittee conduct a comprehensive study that includes a preliminary evaluation of the sewerage facility and a system-wide inventory/evaluation survey that identifies the causes of the untreated/primary-treated overflows and contains deadlines for correcting the problems. This report is due **three years from the effective date** of the permit.

F. Representative Sampling

The draft permit has expanded the requirement in the federal regulations regarding monitoring (40 CFR 122.41[j]). This provision now specifically requires representative sampling whenever a bypass, spill, or non-routine discharge of pollutants occurs, if the discharge may reasonably be expected to cause or contribute to a violation of an effluent limit under the permit. If such a discharge occurs, the City must conduct additional, targeted monitoring to quantify the effects of the discharge on the final effluent. This provision is included in the draft permit because routine monitoring could easily miss permit violations and/or water quality standards exceedences that could result from bypasses, spills, or non-routine discharges.

IX. OTHER PERMIT CONDITIONS

A. Quality Assurance Plan

Federal regulations at 40 CFR 122.41(e) require permittees to properly operate and maintain their facilities, including "adequate laboratory controls and appropriate quality assurance procedures." To implement this requirement, the draft permit requires that the City develop a Quality Assurance Plan to ensure that monitoring data are accurate and to explain data anomalies if they occur. The City is required implement the plan within **120 days of the effective date** of the draft permit. The Quality Assurance Plan must include standard operating procedures the City must follow for collecting, handling, storing and shipping samples, laboratory analysis, and data reporting.

B. Operation & Maintenance Plan

Section 402 of the Clean Water Act and federal regulations 40 CFR 122.44(k)(2) and (3) authorize EPA to require best management practices, or BMPs, in NPDES permits. BMPs are measures for controlling the generation of pollutants and their release to waterways. For municipal facilities, these measures are typically included in the facility's Operation & Maintenance (O&M) plan. These measures are important tools for waste minimization and pollution prevention.

The draft permit requires the City of Puyallup to incorporate appropriate BMPs into their O&M plan within **180 days of permit issuance**. Specifically, the City must consider spill prevention and control, optimization of chemical use, public education aimed at controlling the introduction of household hazardous materials to the sewer system, and water conservation. To the extent that any of these issues have already been addressed, the City need only reference

the appropriate document in its O&M plan. The O&M plan must be revised as new practices are developed.

As part of proper operation and maintenance, the draft permit requires the City to develop a facility plan when the annual average flow exceeds 85 percent of the design flow of the plant (9.46 mgd). This plan requires the City to develop a strategy for remaining in compliance with effluent limits in the permit.

C. Additional Permit Provisions

In addition to facility-specific requirements, sections IV, V, and VI of the draft permit contain "boilerplate" requirements. Boilerplate is standard regulatory language that applies to all permittees and must be included in NPDES permits. Because the boilerplate requirements are based on regulations, they cannot be challenged in the context of an NPDES permit action. The boilerplate covers requirements such as monitoring, recording, and reporting requirements, compliance responsibilities, and general requirements.

X. OTHER LEGAL REQUIREMENTS

A. Endangered Species Act

Section 7 of the Endangered Species Act requires federal agencies to consult with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) if the actions could beneficially or adversely affect any threatened or endangered species. EPA requested lists of threatened and endangered species from the NMFS and USFWS in letters dated December 10, 1999. In a letter dated January 24, 2000, the USFWS identified the Bald eagle (*Haliaeetus leucocephalus*) and Bull trout (*Salvelinus confluentus*) as threatened. In a phone call on December 16, 1999, the NMFS identified the Chinook salmon (*Oncorhynchus tshawytscha*) as threatened. Neither agency identified any proposed or candidate species.

The EPA has tentatively determined that issuance of the NPDES permit is **not likely to adversely effect** the bald eagle or the cutthroat trout. The EPA has also made the determination that the discharge is **not likely to jeopardize** the chinook salmon. A biological evaluation has been provided to the NMFS and USFWS for the bald eagle, bull trout, and the chinook salmon. The EPA has also provided copies of the draft permit and fact sheet. Any comments received from these agencies regarding this determination will be considered prior to reissuance of this permit.

Under the Magnuson-Stevens Fishery Conservation and Management Act, the NMFS and various fisheries management councils must identify and protect "essential fish habitat" for species managed under the Act. The NMFS and fisheries councils reviewed the City of Puyallup facilities planning documents for completeness. This plan has since been approved. Any comments received from the NMFS regarding the finding of **no effect** will be considered prior to reissuance of this permit.

B. Certification

Section 401 of the Clean Water Act requires EPA to seek certification from the Tribe that the permit is adequate to meet Tribal water quality standards before issuing a final permit. The regulations allow for the Tribe to stipulate more stringent conditions in the permit, if the certification cites the Clean Water Act or Tribal law provisions upon which that condition is based. In addition, the regulations require a certification to include statements of the extent to which each condition of the permit can be made less stringent without violating the requirements of Tribal law.

Part of the Tribe's certification is authorization of a mixing zone. The draft permit contains a mixing zone based on the provisions in the Puyallup Water Quality Standards. If the Tribe authorizes a different mixing zone in its final certification, EPA will recalculate the effluent limitations based on the dilution available in the final mixing zone. If the Tribe does not certify the mixing zone, EPA will recalculate the permit limitations based on meeting water quality standards at the point of discharge.

C. Permit Expiration

This permit will expire **five years from the effective date**.

REFERENCES

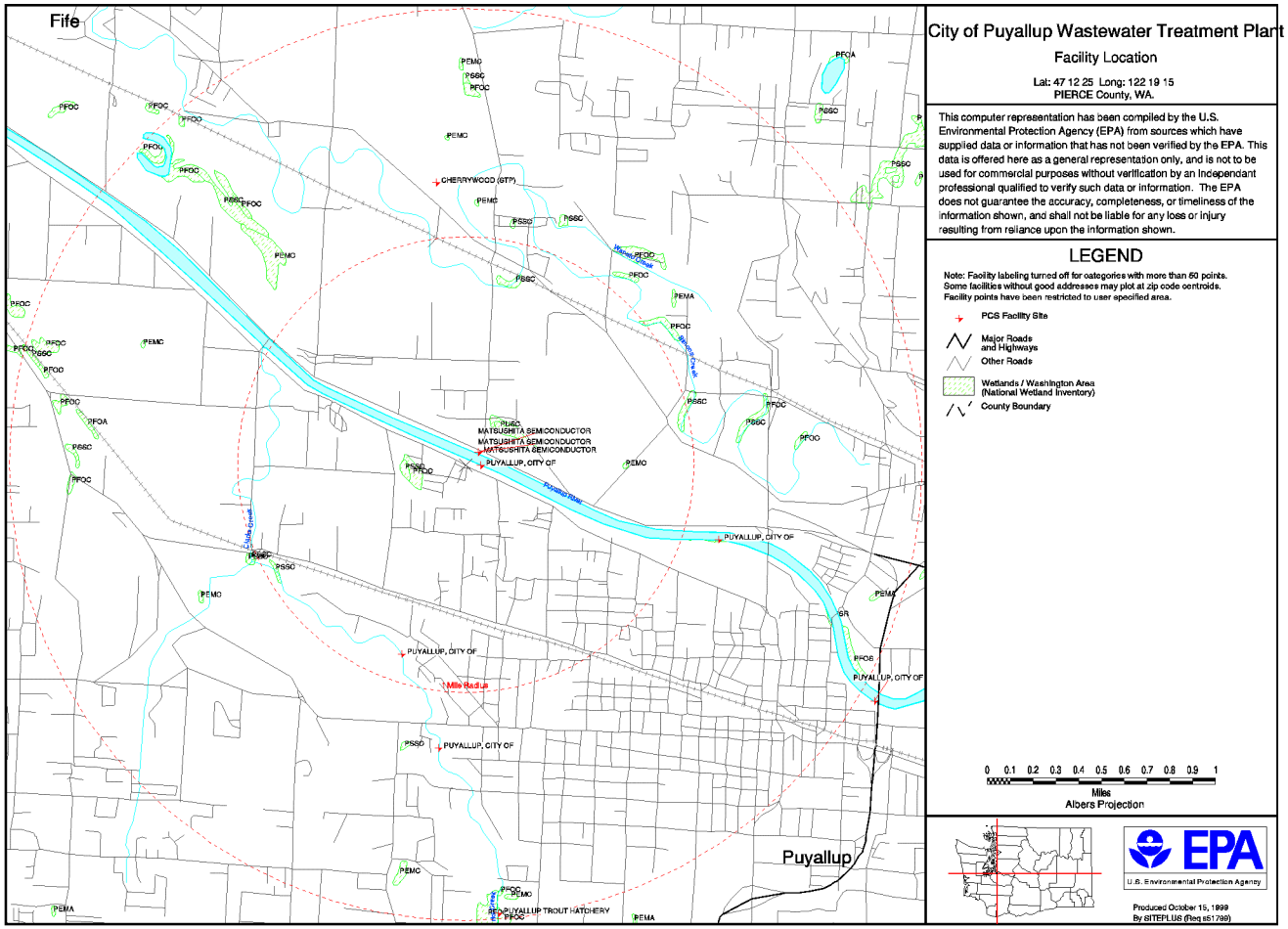
EPA 1991. *Technical Support Document for Water Quality-based Toxics Control*. Office of Water Enforcement and Permits, Office of Water Regulations and Standards. Washington, D.C., March 1991. EPA/505/2-90-001.

Fischer, H.B., and E.J. List, R.C.Y. Koh, J. Imberger, N. H. Brooks, 1979*. Mixing in Inland and Coastal Waters*.

Washington State Department of Ecology, 1993. *Puyallup River Total Maximum Daily Load for Biochemical Oxygen Demand, Ammonia, and Residual Chlorine*. June 1993.

APPENDIX A - CITY OF PUYALLUP FACILITY LOCATION

Figure A-1: Puyallup Wastewater Treatment Facility Location



APPENDIX B - CITY OF PUYALLUP WASTE STREAMS AND TREATMENT PROCESSES

I. Discharge Composition

In determining the pollutants present in the discharge and their maximum concentrations, EPA considered the City's NPDES application and discharge monitoring reports. Table B-1 lists the maximum concentration of pollutants reported by the City as being detected in its discharge. The toxic and conventional pollutant categories are defined in the regulations (40 CFR 401.15 and 401.16, respectively). The category of nonconventional pollutants includes all pollutants not included in either of the other categories.

Table B-1: Pollutants Detected in Discharge

Pollutant Type	Parameter	Maximum Reported Concentration
Conventional	BOD_5, monthly average	28 mg/l
	TSS, monthly average	19 mg/l
	pH, min - max	7.0 - 7.3 s.u.
	Fecal Coliform Bacteria, weekly average	181 /100ml
Toxic	Copper, daily maximum[1]	33 µg/l
	Lead, daily maximum[1]	2 µg/l
	Mercury, daily maximum[1]	0.06 µg/l
	Zinc, daily maximum[1]	37 µg/l
	bis (2-ethylhexyl) phthalate, daily maximum	0.1 µg/l
Non-conventional	Ammonia, monthly average	33 mg/l
	Phosphorus, monthly average	6.6 mg/l
	Temperature	$22^{O}C$

Footnote
1 Metals concentrations are reported as total metals.

II. Treatment Processes

Preliminary treatment:

- Solids removal (bar screen)
- Dewatering and landfilling removed solids
- Preaeration/grit removal (grit chamber)
- Comminution

Primary treatment:

- Primary Clarification

Secondary treatment:

- Activated Sludge
- Secondary Clarification
- UV Disinfection

Final Discharge

- Design flow - 9.46 mgd
- Maximum effluent flow - 7.15 mgd

Biosolids (sludge) handling

- Anaerobic digestion
- Belt filter press
- Hauling by private contractor for land application

APPENDIX C - BASIS FOR EFFLUENT LIMITATIONS

I. Statutory and Regulatory Basis for Limits

Sections 101, 301(b), 304, 308, 401, 402, and 405 of the Clean Water Act provide the basis for the effluent limitations and other conditions in the draft permit. The EPA evaluates discharges with respect to these sections of the CWA and the relevant NPDES regulations to determine which conditions to include in the draft permit.

In general, the EPA first determines which technology-based limits must be incorporated into the permit. EPA then evaluates the effluent quality expected to result from these controls, to see if it could result in any exceedences of the water quality standards in the receiving water. If exceedences could occur, EPA must include water quality-based limits in the permit. The draft permit limits reflect whichever requirements (technology-based or water quality-based) are more stringent. A table of the limits that EPA is proposing in the draft permit is found in Section V of this fact sheet. This Appendix describes the technology-based and water quality-based evaluations for the City of Puyallup.

II. Technology-based Evaluation

The 1972 Clean Water Act required publicly owned treatment works (POTWs) to meet performance-based requirements based on available wastewater treatment technology. Under Section 301(b)(1)(B) of the CWA, EPA was required to develop a performance level referred to as “secondary treatment” for POTWs.

Based on this statutory requirement, EPA developed secondary treatment regulations which are specified in 40 CFR Part 133.102. These technology-based regulations apply to all municipal wastewater treatment plants and identify the minimum level of effluent quality attainable by secondary treatment in terms of five-day biochemical oxygen demand (BOD_5), total suspended solids (TSS), and pH. Section IV of this Appendix discusses the details of the evaluation for each of these pollutants.

III. Water Quality-based Evaluation

In addition to the technology-based limits discussed above, EPA evaluated the discharge to determine compliance with Section 301(b)(1)(C) of the Clean Water Act. This section requires the establishment of limitations in permits necessary to meet water quality standards by July 1, 1977.

The regulations at 40 CFR 122.44(d)(1) implement section 301(b)(1)(C) of the Clean Water Act. These regulations require that NPDES permits include limits for all pollutants or parameters which “are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above

any State water quality standard, including State narrative criteria for water quality." These regulations also apply to Tribal water quality standards. The limits must be stringent enough to ensure that water quality standards are met, and must be consistent with any available wasteload allocation (WLA).

In determining whether water quality-based limits are needed and developing those limits when necessary, EPA uses the approach outlined below:

a. Determine the appropriate water quality criteria
b. Determine whether there is "reasonable potential" to exceed the criteria
c. If there is "reasonable potential", develop a WLA
d. Develop effluent limitations based on the WLA

Appendix D provides example calculations for total ammonia to illustrate how these steps are implemented.

A. Determine Water Quality Criteria

The first step in developing water quality-based limits is to determine the applicable water quality criteria. The applicable criteria are determined based on the beneficial uses of the receiving water as identified in Section III of the Fact Sheet. For any given pollutant, different uses may have different criteria. To protect all beneficial uses, the permit limits are based on the most stringent of the water quality criteria applicable to those uses (see Table C-1).

B. Reasonable Potential Evaluation

To determine if there is "reasonable potential" to cause or contribute to an exceedence of the water quality criteria for a given pollutant, EPA compares applicable water quality criteria to the maximum projected downstream concentrations for a particular pollutant. If the projected downstream concentration exceeds the criteria, there is "reasonable potential" and a water quality-based effluent limit must be included in the permit. Table C-1 summarizes the data, multipliers, and criteria used to determine "reasonable potential" to exceed criteria. When all effluent data for a particular pollutant were below the detection limit (for example, toluene), EPA assumed that there was no reasonable potential.

Table C-1: Reasonable Potential Evaluation

Parameter	Maximum Reported Conc	Number of Samples	CV	Reasonable Potential Multiplier	Maximum Projected Effluent Conc (C_e)	Upstream Conc (C_u)	Projected Downstream Conc (C_d)	Most Stringent Criterion
pH, min - max	7.0 - 7.3	NA	NA	NA	NA	6.7- 7.9	NA	6.5 -8.5
Fecal Coliform Bacteria, #/100 ml	181 /100ml	NA	NA	NA	NA	>100[1]	>100	100
Copper, µg/l	33[2]	25	0.23	1.4	46	2.9[2]	5.7[3]	3.3[4]
Lead, µg/l	2[2]	2	0.6	7.4	15	0	0.88[3]	0.41[4]
Mercury, µg/l	0.06[2]	23	0.5	1.9	0.11	0.08[1, 2]	0.083[3]	0.012
Zinc, µg/l	37[2]	2	0.6	7.4	270	8.1[2]	140[3,5]	46[4, 5]
bis (2-ethylhexyl) phthalate, µg/l	0.1	2	0.6	7.4	0.74	0.1	0.16	1.8
Ammonia, mg/l	33	58	0.5	1.5	49	0.07	4.4[3]	1.2
Temperature, ^{O}C	22	1825	0.6	1	22	15.7	16.2	18

1 Because background exceeds the criterion, there is no assimilative capacity, so the criterion applies “end-of-pipe”.
2 Effluent and upstream concentrations for these metals are expressed as total recoverable metals.
3 The projected downstream concentration exceeds the criterion: therefore, a limit is needed.
4 Criteria for these metals apply as dissolved metal.
5 For zinc, the draft permit limit is based on the acute criterion because the projected maximum concentration at the edge of the acute mixing zone exceeds the acute criterion and the projected maximum concentration at the edge of the chronic mixing zone meets the chronic criterion.

EPA used the recommendations in Chapter 3 of the *Technical Support Document for Water Quality-based Toxics Control* (TSD, EPA 1991) to conduct this "reasonable potential" analysis for the City of Puyallup Wastewater Treatment Plant. An example reasonable potential (RP) analysis for total ammonia is found in Appendix D.

The maximum projected downstream concentration, C_d, is determined using the following mass balance equation.

$$C_d = \frac{(C_e \times Q_e) + (C_u \times Q_u)}{Q_d}$$

where,

C_d = receiving water concentration downstream of the effluent discharge (at the edge of the mixing zone)
C_e = maximum projected effluent concentration
= maximum reported effluent value X reasonable potential multiplier
Q_e = design flow
C_u = upstream concentration of pollutant
Q_u = upstream flow
Q_d = receiving water flow downstream of the effluent discharge
= $Q_e + Q_u$

Substituting the equality:

$$D = \frac{(Q_u + Q_e)}{Q_e}$$

where,

D = dilution factor

the equation becomes:

$$C_d = \frac{(C_e - C_u)}{D} + C_u$$

Sections 1 through 4 below discuss each of the factors used in the mass balance equation to calculate C_d.

1. Effluent Concentration

The maximum projected effluent concentration (C_e) in the mass balance equation is based on the 99th percentile, calculated using the statistical approach recommended in the TSD. The 99th percentile effluent

concentration is calculated by multiplying the maximum reported effluent concentration by a reasonable potential multiplier.

The reasonable potential multiplier accounts for uncertainty in the data. The multiplier decreases as the number of data points increases and variability of the data decreases. Variability is measured by the coefficient of variation (CV) of the data. When there are not enough data to reliably determine a CV, the TSD recommends using 0.6 as a default value. A partial listing of reasonable potential multipliers can be found in Table 3-1 of the TSD. See Table C-1 for a summary of maximum reported effluent concentrations, reasonable potential multipliers, and maximum projected effluent concentrations.

2. Upstream (Ambient) Concentration

The ambient concentration in the mass balance equation is based on a reasonable worst-case estimate of the pollutant concentration upstream from the City of Puyallup's discharge. For criteria that are expressed as maxima (for example, copper, ammonia), the 95th percentile of the ambient data is generally used as an estimate of worst-case. For criteria that are expressed as minima (for example, pH) the 5th percentile of the ambient data is generally used as an estimate of worst-case. These percentiles were calculated based on data generated as part of the TMDL study conducted by the Department of Ecology (Ecology, 1993). Where there were no data to determine the ambient concentration, zero was used in the mass balance equation. See Table C-1 for a summary of ambient concentrations for specific pollutants.

3. Dilution

Under the Tribe's water quality standards, dischargers are not authorized to use the entire upstream flow for dilution of their effluent. Instead, the standards contain the following restrictions on mixing zones for determining compliance with chronic criteria:

> The size may be up to 300 feet plus the horizontal length of the diffuser downstream, 100 feet upstream, and 25 percent of the width of the river at the 7Q10[1] flow;
>
> The mixing zone may not be more than 25 percent of the volume of the 7Q10 flow.

---

[1]The 7Q10 (7-day, 10-year low flow) is the 7-day average low flow that has a 10 percent chance of occurring in any given year. The 7Q10 was calculated based on the Log Pearson Type III distribution using United States Geological Survey (USGS) data. The 7Q10 flow for the Puyallup River is 757 cubic feet per second (cfs).

The acute mixing zone is the same width and 10 percent of the length of the chronic mixing zone. In addition, the acute mixing zone is limited to 10 percent of the volume of the chronic mixing zone, or 2.5 percent of the 7Q10 flow.

The effluent flow used to calculate the dilution is the design flow of the facility. For the City of Puyallup, the design flow is 9.46 million gallons per day (mgd).

Table C-2 shows the dilutions at the edge of the mixing zones calculated using the design flow and the two-dimensional advection dispersion equation as described by Fischer (1979).

Table C-2: Design Flows and Dilution

Mixing Zone	Dilution
Acute aquatic life	1.8
Chronic aquatic life	11.5
Human health for carcinogens	36
Human health for non-carcinogens	16

In accordance with the Puyallup Tribe's water quality standards, only the Tribe may authorize mixing zones. If the Tribe authorizes a different size mixing zone in its final 401 certification, EPA will recalculate the reasonable potential and effluent limits based on the final mixing zone. If the Tribe does not authorize a mixing zone in its 401 certification, EPA will recalculate the limits based on meeting water quality criteria at the point of discharge.

C. Wasteload Allocation Development

Once EPA has determined that a water quality-based limit is required for a pollutant, the first step in developing a permit limit is development of a wasteload allocation (WLA) for the pollutant. A WLA is the concentration (or loading) of a pollutant that the permittee may discharge without causing or contributing to an exceedence of water quality standards in the receiving water. WLAs for this permit were calculated in three ways: based on a mixing zone for pH, copper, lead, and zinc, based on a WLA established as part of a TMDL for ammonia and BOD_5, and based on meeting water quality criteria at "end-of-pipe" for fecal coliform and mercury.

1. Mixing zone-based WLA

Where the Tribe authorizes a mixing zone for the discharge, the WLA is calculated as a mass balance, based on the available dilution, background concentrations of the pollutant(s), and the water quality criteria. The mass balance equation is the same as that used to calculate reasonable potential, with the acute or chronic criterion substituted for C_d and the WLA substituted for C_e.

Because acute aquatic life, chronic aquatic life, and human health criteria apply over different time frames and may have different mixing zones, it is not possible to compare them directly to determine which criterion results in more stringent limits. For example, the acute criteria are applied as a one-hour average and have a smaller mixing zone, while the chronic criteria are applied as a four-day average and have a larger mixing zone. To allow for comparison, the acute, chronic, and human health WLAs are statistically converted to long-term average WLAs. The most stringent long-term average WLA resulting from these conversions is used to calculate the permit limits.

2. TMDL-based WLA

Where the receiving water quality does not meet water quality standards, the WLA is generally based on a TMDL developed by the state or EPA. A TMDL is a determination of the amount of a pollutant, from point, nonpoint, and natural background sources, including a margin of safety, that may be discharged to a water body without causing the water body to exceed the criterion for that pollutant. Any loading above this capacity would violate water quality standards. Section 303(d) of the CWA requires states to develop TMDLs for waterbodies that will not meet water quality standards after the imposition of technology-based effluent limitations, to ensure that these waters will come into compliance with water quality standards.

The first step in establishing a TMDL is to determine the assimilative capacity (the loading of pollutant that a water body can assimilate without exceeding water quality standards), accounting for seasonal variation, if appropriate. The next step is to divide the assimilative capacity into allocations for non-point sources (called load allocations), point sources (called WLAs), natural background loadings, and a margin of safety to account for any uncertainties. Permit limitations are then developed for point sources that are consistent with the WLAs.

See section IV.A of this Appendix for details on the TMDL used to derive the limits in the draft permit for BOD_5 and ammonia.

3. “End-of-Pipe” WLA

In some cases, there is no dilution available. For example, the Tribe may decide not to authorize a mixing zone for a particular pollutant, or the receiving water may exceed the criterion for a particular pollutant, leaving no “clean” upstream water available for dilution. When there is no dilution, the criterion becomes the WLA.

D Permit Limit Derivation

Once the WLA has been developed, EPA applies the statistical permit limit derivation approach described in Chapter 5 of the TSD to obtain daily maximum and monthly average permit limits. This approach takes into account effluent variability (through the CV), sampling frequency, and the difference in time frames between the monthly average and daily maximum limits.

The daily maximum limit is based on the CV of the data and the probability basis, while the monthly average limit is dependent on these two variables and the monitoring frequency. As recommended in the TSD, EPA used a probability basis of 95 percent for monthly average limit calculation and 99 percent for the daily maximum limit calculation. As with the reasonable potential calculation, when there were not enough data to calculate a CV, EPA assumed a CV of 0.6 for both monthly average and daily maximum calculations. Where limits were necessary for specific pollutants, the CVs in Table C-1 were used. Appendix D provides an example permit limit calculation.

E. Antidegradation

In addition to water quality-based limitations for pollutants that could cause or contribute to exceedences of numeric or narrative criteria, EPA must consider the Tribe’s antidegradation policy. This policy is designed to protect existing water quality when it is better than that required to meet the standard. In addition, when the existing quality is at the level of the standard, the antidegradation policy prevents water quality from being degraded below the standard when existing quality.

For waters that are at the level of the standard (known as “Tier 1" waters), the antidegradation policy requires that water quality standards continue to be met. For waters with better quality than the standards (known as “high quality” or “Tier 2" waters), antidegradation requires that no lowering of water quality be allowed unless the Tribe finds that allowing lower water quality is necessary to accommodate important economic or social development before

any lowering of water quality is authorized. The Tribe may also designate waters as “Tier 3," in which case no lowering of water quality is allowed.

The Tribe has no implementation guidance for their antidegradation policy. Therefore, the Puyallup River in the vicinity of the City's discharge has not been assigned to any tier. However, the limits in the permit ensure that uses are protected and water quality standards are met.

IV. Pollutant-specific Analysis

This section outlines the basis for each of the effluent limitations in the City of Puyallup’s draft permit.

A. Biochemical Oxygen Demand

The Puyallup WWTP is a POTW. As such, the facility is subject to the technology-based requirements for oxygen-demanding substances. Typically, oxygen-demanding substances are controlled by limitations on five-day biochemical oxygen demand (BOD_5), as specified in 40 CFR 133.102(a)(1)-(3). The technology requirements for BOD_5 are 30 and 45 mg/l as monthly and weekly average concentrations, respectively. In addition, POTWs must achieve a monthly average percent removal requirement for BOD_5 of at least 85 percent. Finally, under 40 CFR 122.45(f), permits must contain mass-based limitations. The concentration requirements were converted to mass limits by multiplying them by the design flow (9.46 mgd) and a conversion factor of 8.34. This resulted in monthly and weekly average loadings of 2,370 and 3,550 lbs/day, respectively. As discussed below, these loading limits are less stringent than water quality-based BOD_5 limitations. Therefore, the concentration-based limits in the draft permit are technology-based and the loading limits are water quality-based.

As discussed in Section III of the Fact Sheet, Ecology developed a TMDL for BOD_5 and ammonia throughout the Puyallup River basin and tributaries effective May 1 through October 31. The maximum loadings established for this river basin were set at 20,322 lb/day of BOD_5 and 3,350 lb/day of ammonia as nitrogen. This includes an unallocated reserve capacity of 3,670 lb/day of BOD_5 and 1,200 lb/day of ammonia. WLAs established for the Puyallup WWTP discharge are 1,390 lb/day of BOD_5 and 880 lb/day of ammonia as nitrogen.

The TMDL also provides an option for dischargers allowing them to reduce the WLA for ammonia and increase in the WLA for BOD_5, since both parameters together influence dissolved oxygen. For each pound of ammonia reduction, the WLA for BOD_5 may increase by 13.4 lb/day. The net effect of

this change in the allocation is considered negligible. In addition, a mediation settlement on May 29, 1998, established a process for allocation of the reserve capacity. A municipal reserve account was established for the City of Puyallup of 509 lb/day of BOD_5 and 166 pounds/day of ammonia (or 2,733 lb/day of BOD_5, if the entire ammonia allocation is exchanged according to the procedure mentioned above). This reserve account may be accessed in accordance with the provisions of the settlement agreement.

At this time, the City has not requested any portion of their reserve account. The Engineering Report submitted for the plant expansion uses the BOD_5/ammonia exchange ratio of 13.4 to 1. For the Phase 1 expansion (2004), the BOD_5 WLA increases from 2,085 (average weekly) to 3,268 lb/day. The ammonia WLA therefore must decrease by 88 pounds to 792 lb/day.

Table C-3 outlines the BOD_5 limits in the draft permit.

Table C-3: BOD Draft Limits

	Concentration (mg/l)	Loading (lb/day)	Minimum Percent Removal (%)
Average Monthly	30	2,178	85
Average Weekly	45	3,268	—

B. Total Suspended Solids

The federal regulations at 40 CFR 133.102(a)(1)-(3) specify technology-based requirements for total suspended solids (TSS) for POTWs. Like BOD_5, these requirements are 30 and 45 mg/l as monthly and weekly average concentrations, respectively, with a monthly average percent removal of at least 85 percent. These requirements were incorporated as limits in the draft permit.

The draft permit contains monthly and weekly average loading limits of 2,370 and 3,550 lbs/day, respectively, based on the design flow and a conversion factor of 8.34. These limits are less stringent than those in the 1994 permit. The Tribe has expressed concern that these limits are higher than necessary and should more accurately reflect what the facility can achieve. Based on the recent compliance data shown in Table 1, it appears that the limits in the 1994 permit are too stringent and do not reflect the increased loadings due to growth of the treatment plant. Therefore, EPA plans to work with the Tribe and the City during the comment period to develop loading limits for TSS that accurately reflect what the plant can achieve, while allowing for growth that is likely to occur during the permit term.

C. Fecal Coliform Bacteria

The Puyallup Tribe's water quality standards state that the geometric mean of fecal coliform bacteria may not exceed 100 colonies/100 ml and no more than 10 percent of the samples used to calculate the mean may exceed 200 colonies/100 ml.

The Puyallup River upstream from the City's discharge sometimes exceeds these criteria. When the upstream water exceeds the criteria, there is no "clean" water to mix with the discharge to enable meeting the criterion downstream, and the discharge must meet the criteria at the point of discharge. Therefore, the criteria have been incorporated directly into the draft permit as a monthly average limit and a requirement that no more than 10 percent of samples exceed 200/100 ml.

D. Total Ammonia (as N)

Low concentrations of ammonia can be toxic to freshwater fish, particularly salmonids. Un-ionized ammonia (NH_3) is the principal toxic form of ammonia. The ammonium ion (NH_4^+) is much less toxic. The relative percentages of these two forms of ammonia in the water vary as the temperature and pH vary. As the pH and temperature increase, the percentage of ammonia that is in the un-ionized form increases, causing increased toxicity.

Because the toxicity of ammonia is dependent upon pH and temperature, the criteria are also pH and temperature dependent. Using a temperature of $15.7^{O}C$ and pH of 7.9 to represent reasonable worst-case conditions, the acute and chronic ammonia criteria are 6.7 and 1.2 mg/l, respectively.

Although it is the un-ionized form that is toxic, the criteria are expressed as total ammonia. As effluent mixes with receiving water, the temperature and pH change, making it difficult to predict how much of the total ammonia in the discharge will convert to the un-ionized form. Therefore, the limits in the draft permit are expressed as total ammonia, not un-ionized ammonia.

Using the statistical permit derivation method in the TSD, EPA calculated daily maximum and monthly average concentration limits of 12 and 5.9 mg/l, respectively. The loadings corresponding to these limits are 950 and 470 lb/day, respectively.

In addition to potential toxicity, ammonia can contribute to dissolved oxygen depression. As discussed in Section A above, Ecology developed a TMDL for ammonia and BOD_5 to address dissolved oxygen concerns in the Puyallup River. The TMDL established a WLA for ammonia for the City's WWTP and

allowed conversion of ammonia loading into BOD_5. Based on the TMDL, the draft permit contains a daily maximum limit on ammonia loading of 792 lb/day from May 1 through October 31. This limitation is more stringent than the daily maximum loading limit derived to prevent toxicity. Table C-4 summarizes the ammonia limitations in the draft permit.

Table C-4: Draft Ammonia Limits

Season	Daily Maximum		Monthly Average	
	Concentration (mg/l)	Loading (lb/day)	Concentration (mg/l)	Loading (lb/day)
November 1 - April 30	12	950	5.9	470
May 1 - October 31	12	792	5.9	470

E. Metals

In the Puyallup Tribe's water quality standards, the most stringent criteria for metals other than arsenic are the criteria for the protection of aquatic life. For arsenic, the most stringent criterion is for protection of human health. This section discusses the calculation of the metals criteria and the conversion of these criteria to limits in the draft permit.

1. Criteria calculation

In evaluating whether limits for specific metals were appropriate and calculating the necessary limits, EPA considered only metals that were detected in the effluent (copper, lead, mercury, and zinc). Except for mercury, the Tribe's aquatic life criteria for these metals are expressed as dissolved metals, calculated as a function of hardness, measured in milligrams per liter calcium carbonate (mg/l $CaCO_3$). As the hardness of the receiving water increases, the toxicity decreases. The criteria for mercury are expressed as total recoverable metal and are independent of hardness.

In addition to the calculation for hardness, the Tribe's criteria include a "conversion factor" to convert from total recoverable to dissolved criteria. Total recoverable metals analysis measures both the particulate and the dissolved fraction of the metal. EPA's criteria for metals were originally expressed as total recoverable. Further research showed that, for most metals, it is the dissolved fraction that is "bioavailable," meaning that it can be taken up by aquatic organisms and cause toxicity. Multiplying the criteria by the conversion factors adjusts the criteria to reflect the fraction

of metal that was dissolved in the toxicity tests used to develop the criteria. Table C-5 shows the criteria equations, including the conversion factors. All criteria are expressed in µg/l. EPA used the hardness at the edge of the acute and chronic mixing zones (37.8 and 26.9 mg/l $CaCO_3$, respectively) in evaluating the criteria for the Puyallup River.

Table C-5: Metals Criteria for the Puyallup River

Parameter		Conversion Factor	Criterion Formula	Criterion (µg/l)
Copper	Acute	0.862	exp(0.9422*ln[hardness]-1.464)	6.1
	Chronic	0.862	exp(0.8545*ln[hardness]-1.465)	3.3
Lead	Acute	0.687	exp(1.273*ln[hardness]-1.460)	16
	Chronic	0.687	exp(1.273*ln[hardness]-4.705)	0.41
Mercury	Acute	N/A[1]	N/A[1]	2.4[1]
	Chronic	N/A[1]	N/A[1]	0.012[1]
Zinc	Acute	0.891	exp(0.8473*ln[hardness]+ 0.8604)	46
	Chronic	0.891	exp(0.8473*ln[hardness]+ 0.7614)	31

1 The acute and chronic criteria are expressed as total recoverable metals and are not hardness-dependent.

Based on data submitted by the City, the above analysis indicates that copper, lead, and mercury show reasonable potential to contribute to exceedences of the chronic criteria at the edge of the chronic mixing zone. In addition, lead shows reasonable potential to contribute to exceedences of the acute criterion at the edge of the acute mixing zone. Therefore, the draft permit contains limits for these metals.

2. Permit Limit Calculation

Although the metals criteria are based on dissolved metal, 40 CFR 122.45(c) requires that metals limits be based on total recoverable metals. This is because changes in water chemistry as the effluent and receiving water mix could cause some of the particulate metal in the effluent to dissolve.

To account for the difference between total recoverable effluent concentrations and dissolved criteria, “translators” are used in calculating effluent limits. “Translators” are based on the fraction of the total recoverable metals that is predicted to be in the dissolved form in the

receiving water. The dissolved wasteload allocation is multiplied by the translator, resulting in a total recoverable value.

Translators can either be site-specific numbers based on data collected using effluent and receiving water, or default numbers recommended by EPA in *The Metals Translator: Guidance for Calculating a Total Recoverable Permit Limit from a Dissolved Criterion* (EPA 823-B-96-007, June 1996). The default translators recommended by EPA are the conversion factors in Table C-5. These translators are based on the fraction of the metal that would be in the dissolved form in water with no particulate matter, which is a worst-case assumption. In waters in which there is particulate matter, the dissolved fraction, and therefore the toxicity, would be lower. Using these translators is equivalent to converting the dissolved criteria back to total recoverable. Because there are no site-specific translators for the Puyallup River, the conversion factors from Table C-5 were used in calculating limits for the draft permit.

Mercury concentrations in the Puyallup River upstream from the City's discharge exceed the criteria. Therefore, in calculating the limits for mercury in the draft permit, EPA established the criterion as the WLA, as discussed in section III.C.3 of this Appendix. Table C-6 summarizes the limits for metals in the draft permit. As with other pollutants, the loading limits are calculated by multiplying the concentration by the effluent flow and a conversion factor of 8.34.

Table C-6: Metals Limits for the City of Puyallup Draft Permit

Parameter	Monthly Average	Daily Maximum
Copper		
µg/l	7.6	10
lbs/day	600	790
Lead		
µg/l	5.6	11
lbs/day	440	870
Mercury		
µg/l	0.010	0.019
lbs/day	0.79	1.5
Zinc		
µg/l	43	86
lbs/day	3,400	6,800

F. pH

Under 40 CFR 133.102 effluent pH must be within the range of 6.0 to 9.0 standard units for POTWs. In addition, the Tribe's water quality standards for protection of aquatic life require that ambient pH be in the range of 6.5 to 8.5 standard units.

Because pH is a logarithmic scale, the statistical approach in the TSD cannot be used to establish reasonable potential. Instead, a model of pH mixing was used to determine the effluent pH values that would result in meeting the criteria at the edge of the mixing zone.

Ambient pH is a function of effluent and ambient pH, flow, alkalinity (buffering capacity), and temperature. The worst-case scenario is a warm, highly buffered effluent being discharged into a warm, poorly buffered stream. Table C-7 shows the values used to represent this scenario.

Table C-7: Input Data for Puyallup River pH Model

	Effluent	Upstream
Temperature, ^{O}C	22	15.7
pH, Standard Units	6.0 - 9.0	6.7 - 7.9
Alkalinity, mg/l $CaCO_3$	150	49

Based on the above data, the model shows that an effluent pH range of 6.0 to 9.0 results in the pH at the edge of the mixing zone ranging from 6.5 to 7.9. This range complies with the Tribe's water quality standards. Therefore, the draft permit contains a pH range of 6.0 to 9.0.

G. Total Residual Chlorine

The 1994 permit contained limits on chlorine. However, as part of the 1999 upgrade, the City changed from chlorine to ultraviolet disinfection of its wastewater. Therefore, chlorine limits are no longer necessary.

APPENDIX D - SAMPLE EFFLUENT LIMIT CALCULATIONS

NPDES Permit Limit Calculation for Ammonia

Step 1: Determine the appropriate criteria

1A. Determine the uses

The Puyallup River is protected by the Puyallup Tribe for the following uses: domestic, industrial and agricultural water supply, stock watering, fish and shellfish (including salmonids, crustaceans and other shellfish, and other fish), wildlife habitat, ceremonial and religious water use, commerce, navigation, and primary and secondary recreation.

1B. Determine the most stringent criterion to protect the uses

The most stringent criterion associated with these uses is for protection of salmonid spawning. The criteria for ammonia are based on temperature and pH (see Appendix C, section IV.D). Using reasonable worst-case assumptions of 7.9 standard units for pH and 15.7^{O}C for temperature, the acute criterion (CMC) and chronic criterion (CCC) corresponding to this level of protection are 6.7 mg/l as a one-hour average and 1.2 mg/l as a four-day average, respectively.

Step 2: Determine whether there is "reasonable potential" to exceed the criteria

2A. Determine the "reasonable potential" multiplier

The "reasonable potential" multiplier is based on the CV of the data and the number of data points. In this case, there are 58 data points, with a CV of 0.5. Using the equations in section 3.3.2. of the TSD, the reasonable potential multiplier (RPM) is calculated as follows:

p_n = (1 - confidence level)$^{1/n}$

where,
p_n = the percentile represented by the highest concentration
n = the number of samples

p_n = (1-0.99)$^{1/58}$
p_n = 92

This means that the largest value in the data set is greater than the 92nd percentile.

Next, the ratio of the 99th percentile to the 92nd percentile is calculated, based on the equation:

$C_p = \exp(zF - 0.5F^2)$

where,

$F^2 = \ln(CV^2 + 1)$
CV = coefficient of variation (= 0.5)
$F^2 = 0.22$

z = normal distribution value
= 2.326 for the 99th percentile
= 1.430 for the 92nd percentile

$C_{99} = \exp(2.326*0.47 - 0.5*0.22)$
$= 2.68$

$C_{98} = \exp(1.430*0.47 - 0.5*0.22)$
$= 1.75$

$RPM = C_{99}/C_{92}$
$= 2.68/1.75$

RPM = 1.5

2B. Calculate the concentration of the pollutant at the edge of the mixing zone

There is reasonable potential to exceed criteria if the maximum projected concentration of the pollutant at the edge of the mixing zone exceeds the criterion. The maximum projected concentration is calculated from the following equation:

$$C_d = \frac{C_e - C_u}{D} + C_u$$

where,

C_d = receiving water concentration at the edge of the mixing zone
C_e = maximum projected effluent concentration
= maximum reported effluent concentration * reasonable potential multiplier (33*1.5 = 49.5 mg/l)
C_u = upstream concentration of pollutant (0.07 mg/l)
D = dilution factor (1.8 for acute, 11.5 for chronic)

For the acute criterion,

$$C_d = \frac{49.5 - 0.07}{1.8} + 0.07$$

C_d = 27.5 mg/l

For the chronic criterion,

$$C_d = \frac{49.5 - 0.07}{11.5} + 0.07$$

C_d = 4.4 mg/l

The concentrations at the edges of the acute and chronic mixing zones are greater than the criteria, therefore a limit must be included in the permit.

Step 3: Calculate the wasteload allocations

Wasteload allocations (WLAs) are calculated using the same mass balance equation used to calculate the concentration of the pollutant at the edge of the mixing zone. However, C_d becomes the acute or chronic criterion and C_e is replaced by the acute or chronic WLA. The equation is rearranged to solve for the WLA, becoming:

$$WLA_a = D*(CMC - C_u) + C_u$$

For the acute criterion

$$WLA_a = 1.8 * (6.7 - 0.07) + 0.07$$

WLA_a = 12 mg/l

For the chronic criterion

$$WLA_c = 11.5 * (1.2 - 0.07) + 0.07$$

WLA_c = 13 mg/l

The WLAs are converted to long-term average concentrations, using the following equations from EPA's *Technical Support Document for Water Quality-based Toxics Control* (TSD):

$$LTA_a = WLA_a * \exp[0.5F^2 - zF]$$

$$LTA_c = WLA_c * \exp[0.5F_4^2 - zF_4]$$

where,

F_4^2 = $\ln(CV^2/4 + 1)$
= 0.61
z = 2.326 for 99th percentile probability basis

LTA_a = 12 * exp[0.5 *0.22 - 2.326 *0.47]

LTA_a = 4.5 mg/l

LTA_c = 13 * exp[0.5 *0.61 - 2.326 *0.25]

LTA_c = 9.8 mg/l

The LTAs are compared and the more stringent is used to develop the daily maximum and monthly average permit limits. In this case, the acute LTA is more stringent.

Step 4: Derive the maximum daily (MDL) and average monthly (AML) permit limits

Using the TSD equations, the MDL and AML permit limits are calculated as follows:

$$MDL = LTA * \exp[zF-0.5F^2]$$

where:
z = 2.326 for 99th percentile probability basis

MDL= 4.5 * exp[2.326 *0.47 - 0.5 *0.22]

MDL= 12 mg/l

$AML = LTA * \exp[zF_n - 0.5F_n^2]$

where:

F_n^2 = $\ln(CV^2/n + 1)$
= 0.03
z = 1.645 for 95th percentile probability basis
n = number of sampling events required per month (8)

$AML = 4.5 * \exp[1.645 * 0.17 - 0.5 * 0.031]$

AML= 5.9 mg/l